

SECTION 9001

ENGINEERING SPECIFICATION: DEDICATED GROUND-WATER SAMPLING PUMP SPECIFICATION

PART 1 --- GENERAL

1.1 SCOPE

- 1.1.1 The manufacturer shall furnish a dedicated ground water sampling system with one or more bladder pumps and associated tubing and well caps for the collection of ground water quality samples.

1.2 PROCESS DESCRIPTION

- 1.2.1 A bladder pump allows water to flow through an inlet check valve into the interior of the pump bladder due to the pressure gradient exerted by the hydrostatic head of the water it is submerged in. After the interior of the bladder is filled with water, compressed gas is applied to the exterior of the bladder to force the water to flow through an outlet check valve and out of the pump. The compressed gas is delivered to the pump through a gas supply tube connected to a compressed gas source with a control device located at the wellhead, and the pump liquid discharge is delivered to the wellhead through a water discharge tube with both tubes terminating in a wellhead cap. The water pumped and conveyed in a manner to minimize alteration of water quality in any way. When the pump bladder is squeezed sufficiently to empty it of water, the compressed gas control device stops the flow of compressed gas and vents the pump's gas supply tube to the atmosphere. This venting allows the pressure on the outside of the pump bladder to decrease to less than that of the hydrostatic head present at the pump inlet due to the pump's submergence. The pump bladder can thereby refill and repeat the cycle as needed to achieve desired flow for purging and sampling the well. The pump controller at the wellhead controls the sequencing of applying compressed gas to and venting of the pump. A compressed gas source at the wellhead provides the necessary flow of compressed gas to the controller. A water level measurement device allows measurement of water levels in the well before and during pumping, and can be connected to the pump controller to temporarily cease pumping when the water level in the well is drawn down beyond preset limits. A flow cell connected to the water discharge tube measures water quality parameters and provides indication of completion of well purging.

1.3 SUBMITTALS

1.3.1 Manufacturer shall submit the following with the bid:

- 1.3.1.1 Product data for selected models, including dimensions, materials of construction, pressure and depth ratings, flow capacity, weights, measurement accuracy, accessories and warranty coverage. See attached data sheets for full specifications.

PART 2 --- PRODUCTS

2.1 GENERAL

- 2.1.1 The sampling pump system shall be a Well Wizard dedicated bladder pump system. See data sheets for model number(s). Equipment shall be manufactured by QED Environmental Systems Inc. and represented by _____ or pre-approved equivalent.

- 2.1.2 All components and options shall meet requirements specified on the data sheets attached to this specification.

2.2 EQUIPMENT DESIGN REQUIREMENTS

- 2.2.1 Standard product design shall include complete bladder pump assembly, with all fittings, check valves, bladder and inlet screens with the following specifications:

- 2.2.1.1 The bladder pumps shall be of squeeze-type design, with water entering the interior of the bladder tube, and air pressure applied to the annular space between the exterior of the bladder and the interior of the pump body.
- 2.2.1.2 The pump shall be capable of running dry without any damage to the pump, controls or power source.
- 2.2.1.3 The pump shall also be capable of continuous operation for a minimum of 12 hours at a low rate of 0.1 L/minute or less without damage, malfunction or automatic shutdown.
- 2.2.1.4 The pump must be capable of lifting water from 300 feet without modification.

- 2.2.1.5 The bladder and all other pump components must be able to withstand 150 PSI differential pressure without damage or malfunction.
- 2.2.1.6 The pump assembly must be able to withstand a submergence of at least 200 feet and an inlet pressure of at least 85 PSI without damage to the bladder or other components; and without slippage of the bladder from its mounting or leakage around the bladder mounting seal.
- 2.2.1.7 Bladders shall be Dura-Flex Type-62 Teflon, field replaceable, and capable of a minimum of 200,000 cycles of operation without failure or leakage. Evidence of this performance must be supported by a minimum of ten years of production QC testing data from the manufacturer of the pumps.
- 2.2.1.8 The pump assembly must be cleaned using a multi-stage washing and rinsing process utilizing phosphate-free laboratory-grade detergent and deionized and filtered water. The cleanliness of the pumps must be certified by soaking the pumps for at least 24 hours in reagent-grade water, with internal recirculation of the water through each pump assembly. Samples of the final soak water shall be analyzed by an independent EPA-certified laboratory for EPA Method 8260 and 625 volatile organic compounds, acid extractable and base-neutral compounds, and results of the analysis correlated to each pump through a numbered and signed certification tag attached to the pump. The efficacy of the cleaning and certification process must be supported by a minimum of ten years of production QC testing data from the manufacturer of the pumps.
- 2.2.1.9 The pump and tubing when assembled must have a minimum tensile strength of 150 pounds without the use of an auxiliary support cable to prevent pump loss and fitting leakage.
- 2.2.1.10 The pump and all of its components including the bladder shall be covered by a minimum standard warranty of 10 years provided by the manufacturer of the pump.

(Choose for PVC Pump)

- 2.2.1.11 The bladder pump shall have an overall length of 42 inches, an outside diameter of 1.66 inches, and a bladder capacity of 395 milliliters; or (where the application warrants) an overall length of 19.5 inches, an outside diameter of 1.66 inches, and a bladder capacity of 130 milliliters.

- 2.2.1.12 The pump must be constructed entirely of PVC and PTFE materials, with lead-free Viton[®] o-rings. The materials used in construction of the pump, including external fittings and connections, must be virgin-grade first-run quality, with no reprocessed or reground ingredient, additives or fillers used.
- 2.2.1.13 All PVC components used must be NSF-grade, extruded specifically with no markings or lubricants.
- 2.2.1.14 Each pump shall be fitted with a PVC inlet screen, 6 inches in length, and having a screen opening size of .010 slot. The screen shall attach directly by threading to the pump inlet housing.
- 2.2.1.15 To provide steady low-flow pumping rates and to minimize sample aeration in the discharge tube and the introduction of air into in-line flow cells, the pump shall have a check valve design that typically allows less than 0.1 ml/minute drainback during the pump refill cycle, and in no more than 0.5 ml/minute drainback during refill.

(Choose for Stainless Steel/Teflon Pump)

- 2.2.1.16 The bladder pump shall have an overall length of 42 inches, an outside diameter of 1.5 inches, and a bladder capacity of 495 milliliters; or (where the application warrants) an overall length of 15 inches, an outside diameter of 1.5 inches, and a bladder capacity of 100 milliliters.
- 2.2.1.17 The pump must be constructed entirely of Type 316 stainless steel and PTFE materials, with lead-free Viton[®] o-rings. The materials used in construction of the pump, including external fittings and connections, must be virgin-grade first-run quality, with no reprocessed or reground ingredient, additives or fillers used.
- 2.2.1.18 All stainless steel components of the pump, including the body, discharge nipple, center discharge rod, fittings, center rod and body cross pins, and inlet screen assembly must be electropolished to remove all traces of embedded scale, rust, foreign debris, oils and grinding compounds from manufacturing; and to passivate the surface of the metal to protect against corrosion, tarnish or oxidation that could affect sample chemistry.
- 2.2.1.19 The pump fittings must be type 316 Stainless Steel, compression-type design with a two-part ferrule and outer compression nut, as manufactured by Swagelock[®], with special provision made to ensure elimination of the standard metal coatings normally present on the threads.
- 2.2.1.20 Each pump shall be provided with a fine stainless steel mesh inlet screen

assembly to protect the pump from malfunction or damage by large solids. The inlet screen shall be 6 inches in length, and of .010 mesh. The screen shall attach to the pump inlet housing by means of stainless steel set screws.

- 2.2.1.21 To provide steady low-flow pumping rates and to minimize sample aeration in the discharge tube and the introduction of air into in-line flow cells, the pump shall have a check valve design that typically allows less than 0.1 ml/minute drainback during the pump refill cycle, and in no more than 0.5 ml/minute drainback during refill.

(Choose for High Pressure Stainless Steel/Teflon Pump)

- 2.2.1.22 The bladder pump shall have an overall length of 42 inches, an outside diameter of 1.66 inches, and a bladder capacity of 395 milliliters.
- 2.2.1.23 The pump must be constructed entirely of Type 316 stainless steel and PTFE materials, with lead-free Viton[®] o-rings. The materials used in construction of the pump, including external fittings and connections, must be virgin-grade first-run quality, with no reprocessed or reground ingredient, additives or fillers used.
- 2.2.1.24 All stainless steel components of the pump, including the body, discharge nipple, center discharge rod, fittings, center rod and body cross pins, and inlet screen assembly must be electropolished to remove all traces of embedded scale, rust, foreign debris, oils and grinding compounds from manufacturing; and to passivate the surface of the metal to protect against corrosion, tarnish or oxidation that could affect sample chemistry.
- 2.2.1.25 The pump fittings must be type 316 Stainless Steel, compression-type design with a two-part ferrule and outer compression nut, as manufactured by Swagelock[®], with special provision made to ensure elimination of the standard metal coatings normally present on the threads.
- 2.2.1.26 Each pump shall be provided with a fine stainless steel mesh inlet screen assembly to protect the pump from malfunction or damage by large solids. The inlet screen shall be 6 inches in length, and of .010 mesh. The screen shall attach to the pump inlet housing by means of stainless steel set screws.

(Choose for Teflon Pump)

- 2.2.1.27 The bladder pump shall have an overall length of 42 inches, an outside diameter of 1.5 inches, and a bladder capacity of 495 milliliters; or (where the application warrants) an overall length of 15 inches, an outside diameter of 1.5 inches, and a bladder capacity of 100 milliliters.
- 2.2.1.28 The pump must be constructed entirely of PTFE materials, with lead-free Viton[®] o-rings. The materials used in construction of the pump, including external fittings and connections, must be 100% virgin-grade first-run quality, with no reprocessed or reground ingredient, additives or fillers used.
- 2.2.1.29 Each pump shall be fitted with a Teflon inlet screen, 6 inches in length, and having a screen opening size of .010 slot. The screen shall attach directly by threading to the pump inlet housing.
- 2.2.1.30 The bladder pumps shall be of squeeze-type design, with water entering the interior of the bladder tube, and air pressure applied to the annular space between the exterior of the bladder and the interior of the pump body.
- 2.2.1.31 The pump shall be capable of running dry without any damage to the pump, controls or power source.
- 2.2.1.32 The pump shall also be capable of continuous operation for a minimum of 12 hours at a low rate of 0.1 L/minute or less without damage, malfunction or automatic shutdown.
- 2.2.1.33 The pump must be capable of lifting water from 300 feet without modification.
- 2.2.1.34 The bladder and all other pump components must be able to withstand 150 PSI differential pressure without damage or malfunction.
- 2.2.1.35 The pump assembly must be able to withstand a submergence of at least 200 feet and an inlet pressure of at least 85 PSI without damage to the bladder or other components; and without slippage of the bladder from its mounting or leakage around the bladder mounting seal.
- 2.2.1.36 Bladders shall be Dura-Flex Type-62 Teflon, field replaceable, and capable of a minimum of 200,000 cycles of operation without failure or

leakage. Evidence of this performance must be supported by a minimum of ten years of production QC testing data from the manufacturer of the pumps.

(Choose for PVC Pump)

- 2.2.1.37 The bladder pump shall have an overall length of 42 inches, an outside diameter of 1.66 inches, and a bladder capacity of 395 milliliters; or (where the application warrants) an overall length of 19.5 inches, an outside diameter of 1.66 inches, and a bladder capacity of 130 milliliters.
- 2.2.1.38 The pump must be constructed entirely of PVC and PTFE materials, with lead-free Viton[®] o-rings. The materials used in construction of the pump, including external fittings and connections, must be virgin-grade first-run quality, with no reprocessed or reground ingredient, additives or fillers used.
- 2.2.1.39 All PVC components used must be NSF-grade, extruded specifically with no markings or lubricants.
- 2.2.1.40 Each pump shall be fitted with a PVC inlet screen, 6 inches in length, and having a screen opening size of .010 slot. The screen shall attach directly by threading to the pump inlet housing.
- 2.2.1.41 To provide steady low-flow pumping rates and to minimize sample aeration in the discharge tube and the introduction of air into in-line flow cells, the pump shall have a check valve design that typically allows less than 0.1 ml/minute drainback during the pump refill cycle, and in no more than 0.5 ml/minute drainback during refill.

(Choose for Stainless Steel/Teflon Pump)

- 2.2.1.42 The bladder pump shall have an overall length of 42 inches, an outside diameter of 1.5 inches, and a bladder capacity of 495 milliliters; or (where the application warrants) an overall length of 15 inches, an outside diameter of 1.5 inches, and a bladder capacity of 100 milliliters.
- 2.2.1.43 The pump must be constructed entirely of Type 316 stainless steel and PTFE materials, with lead-free Viton[®] o-rings. The materials used in construction of the pump, including external fittings and connections, must be virgin-grade first-run quality, with no reprocessed or reground ingredient, additives or fillers used.
- 2.2.1.44 All stainless steel components of the pump, including the body, discharge nipple, center discharge rod, fittings, center rod and body cross pins, and inlet screen assembly must be electropolished to remove all traces of embedded scale, rust, foreign debris, oils and grinding compounds from

manufacturing; and to passivate the surface of the metal to protect against corrosion, tarnish or oxidation that could affect sample chemistry.

- 2.2.1.45 The pump fittings must be type 316 Stainless Steel, compression-type design with a two-part ferrule and outer compression nut, as manufactured by Swagelock[®], with special provision made to ensure elimination of the standard metal coatings normally present on the threads.
- 2.2.1.46 Each pump shall be provided with a fine stainless steel mesh inlet screen assembly to protect the pump from malfunction or damage by large solids. The inlet screen shall be 6 inches in length, and of .010 mesh. The screen shall attach to the pump inlet housing by means of stainless steel set screws.
- 2.2.1.47 To provide steady low-flow pumping rates and to minimize sample aeration in the discharge tube and the introduction of air into in-line flow cells, the pump shall have a check valve design that typically allows less than 0.1 ml/minute drainback during the pump refill cycle, and in no more than 0.5 ml/minute drainback during refill.

(Choose for High Pressure Stainless Steel/Teflon Pump)

- 2.2.1.48 The bladder pump shall have an overall length of 42 inches, an outside diameter of 1.66 inches, and a bladder capacity of 395 milliliters.
- 2.2.1.49 The pump must be constructed entirely of Type 316 stainless steel and PTFE materials, with lead-free Viton[®] o-rings. The materials used in construction of the pump, including external fittings and connections, must be virgin-grade first-run quality, with no reprocessed or reground ingredient, additives or fillers used.
- 2.2.1.50 All stainless steel components of the pump, including the body, discharge nipple, center discharge rod, fittings, center rod and body cross pins, and inlet screen assembly must be electropolished to remove all traces of embedded scale, rust, foreign debris, oils and grinding compounds from manufacturing; and to passivate the surface of the metal to protect against corrosion, tarnish or oxidation that could affect sample chemistry.
- 2.2.1.51 The pump fittings must be type 316 Stainless Steel, compression-type design with a two-part ferrule and outer compression nut, as manufactured by Swagelock[®], with special provision made to ensure elimination of the standard metal coatings normally present on the threads.

- 2.2.1.52 Each pump shall be provided with a fine stainless steel mesh inlet screen assembly to protect the pump from malfunction or damage by large solids. The inlet screen shall be 6 inches in length, and of .010 mesh. The screen shall attach to the pump inlet housing by means of stainless steel set screws.

(Choose for Teflon Pump)

- 2.2.1.53 The bladder pump shall have an overall length of 42 inches, an outside diameter of 1.5 inches, and a bladder capacity of 495 milliliters; or (where the application warrants) an overall length of 15 inches, an outside diameter of 1.5 inches, and a bladder capacity of 100 milliliters.
- 2.2.1.54 The pump must be constructed entirely of PTFE materials, with lead-free Viton[®] o-rings. The materials used in construction of the pump, including external fittings and connections, must be 100% virgin-grade first-run quality, with no reprocessed or reground ingredient, additives or fillers used.
- 2.2.1.55 Each pump shall be fitted with a Teflon inlet screen, 6 inches in length, and having a screen opening size of .010 slot. The screen shall attach directly by threading to the pump inlet housing.

2.2.2 Pump Tubing

- 2.2.2.1 Each pump shall be supplied with tubing to meet the following specifications;
- 2.2.2.2 The air supply and discharge tubing shall be thermally bonded together for installation as a single line, without any external sheathing material or cable ties. The air supply and discharge tubing shall be able to be separated without the use of any tools for attachment to fittings. Once separated, the remaining bonding ridge shall not require trimming or removal for installation into a compression-type fitting for leak-tight connection to compression type fittings.
- 2.2.2.3 Tubing shall be ¼" air supply, with discharge sized to match the bladder pump. The tolerance on the diameter shall not exceed + 0.05 inches, and shall fit into standard-sized compression-type fittings without trimming, reaming or resizing.
- 2.2.2.4 The tubing shall have a minimum bend radius of 1.25 inches, and must be able to withstand 300 PSI working pressure.

QED SAMPLE ENGINEERING SPECIFICATION

2.2.2.5 All materials must be 100% virgin-grade, extruded in the USA with US-manufactured resins, with no regrind materials, additives, fillers, mold release agents or printing.

2.2.2.6 Each tubing bundle shall be provided with inserts (material to be compatible with the pump construction) needed for secure connection to the pump and wellhead assembly.

(Choose for Polyethylene Tube)

2.2.2.7 The tubing shall be manufactured of all polyethylene.

(Choose for Teflon-Lined Polyethylene Tube)

2.2.2.8 The tubing shall be manufactured of polyethylene, with the discharge tubing having an inner-wall lining of Teflon.

2.2.2.9 The tubing shall be provided with rigid inserts inside the end of the tube connected to the pump fittings, to prevent discharge flow from being blocked due to the Teflon lining being pushed or peeled back into the liquid flow path.

(Choose for Teflon Tube)

2.2.2.10 The tubing shall be manufactured of all Teflon.

2.2.3 Wellhead Cap Assembly

2.2.3.1 Each pump shall be supplied with a well cap assembly to meet the following specifications;

2.2.3.2 The system shall include a well head cap assembly designed to support the weight of the down-well system components and limit the access to the well to prevent accidental contamination or damage.

2.2.3.3 The cap body shall be constructed of anodized aluminum, require less than 1/4" vertical clearance between the top of the casing and the underside of any existing protective well closures, and be machined to fit standard well casing diameters without interference to allow easy installation and removal without modification. Manufacturer shall also be able to provide caps for specialized applications requiring water tight, or locking capabilities.

2.2.3.4 The pump air supply fitting shall consist of a compression-type brass fitting for connection to the pump air supply tubing, and a quick-connect

brass fitting for connection to the controlled air supply hose.

- 2.2.3.5 The pump discharge fitting shall be a bore-through design that allows the discharge tubing to pass continuously through the cap, preventing sample water from contacting the fitting. The cap shall also include a flexible discharge tube, constructed of inert materials, which attaches via a slip fit grip ring to the pump discharge tube end and stores between uses in the water level measurement hole.
- 2.2.3.6 The cap shall include an access hole for water level measurement and include a polyethylene dust protection cap to cover the entire cap to prevent accidental introduction of contaminants to the fittings or well.
- 2.2.3.7 The cap shall include as standard equipment a polyethylene tag with special writing surface to allow marking well identification and pump controller setting information.

2.2.4 Freeze Protection

- 2.2.4.1 Each pump shall be provided with freeze protection that shall meet the following specifications;
- 2.2.4.2 The cap shall include a means of freeze protection that will allow for the positive discharge of any water in the tubing to prevent blockage of flow due to ice formation or damage to the pump discharge tubing near the well head.

(Choose for Freeze Protection Kit-MicroPurge Applications)

- 2.2.4.3 The freeze protection kit shall consist of a length of flexible polyethylene tubing 0.125" OD with a quick-connect brass fitting allowing connection to the controller compressed gas supply hose end. Water in the discharge tube near the wellhead can be removed by inserting the 0.125" tube into the pump liquid discharge tube end at the wellhead, then applying gentle drive gas pressure to the 0.125" tube. An optional in-line filter shall be available for removal of organic and particulate contaminants from the gas supply if desired.

(Choose for freeze prevention in standard 3-5 well volume applications)

- 2.2.4.4 A special tube coupler of appropriate size and material with a .020 inch diameter drilled hole installed shall be supplied to allow for drain back and prevent in-line freezing once sampling is completed.

2.2.5 General System Specifications and Vendor Requirements

QED SAMPLE ENGINEERING SPECIFICATION

- 2.2.5.1 The manufacturer shall have a minimum of 15 years experience providing pneumatic bladder pumps in groundwater monitoring applications.
- 2.2.5.2 The entire system shall be covered by a standard one-year warranty provided by the manufacturer, with the exception of the bladder pumps which shall be covered by a standard ten-year warranty as noted in A.12 above.
- 2.2.5.3 The manufacturer shall provide full product technical support by telephone during normal business hours, and additional 7 day/24 hour support via a toll-free telephone hotline.
- 2.2.5.4 The manufacturer shall have a local factory trained agent, and shall have OSHA certified technicians available for installation or start-up assistance.
- 2.2.5.5 The manufacturer shall have a minimum of eleven (11) years experience with a pump certification program as described in 2.2.1.8.
- 2.2.5.6 Manufacturer's facility shall include a 300' test well for flow rate verification.
- 2.2.5.7 Manufacturer must be capable of shipping all standard equipment within ten working days of receipt of order.

- 2.2.5.8 All bladder pumps, downwell tubing, well caps, and accessories to be supplied by:

QED Environmental Systems, Inc.
P.O. Box 3726
Ann Arbor, MI 48106
(800) 624-2024 (734) 995-1170 FAX
www.qedenv.com

Teflon® and Viton® are registered trademarks of DuPont Company
Swagelock® is a registered trademark of the Swagelock Corporation.